

Predict & Test – Time and Space Complexity

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Key Points to Emphasize

- $O(1)$ → constant, fast, memory minimal
- $O(n)$ → grows linearly with input
- $O(\log n)$ → halves each step, very efficient for large datasets
- $O(n^2)$ → nested tasks, slow, resource-intensive

Learner Kit: Predict & Test – Time and Space Complexity (No Code)

Step 1: Scenarios

Instructions: Read each scenario, discuss in groups, and **write your predictions**.

Scenario	Predicted Time Complexity	Predicted Space Complexity	
1. Checking one locker in a school of 500 students	$O(1)$	$O(1)$	Only one of student
2. Calling each student in a roll call of 500 students	$O(n)$	$O(1)$	Each student the number
3. Guessing a number between 1–100 by halving each time	$O(\log n)$	$O(1)$	Each guess grows lower
4. Pairing every student with every other student for a group project	$O(n^2)$	$O(n^2)$	Each student (n-1)/2 comparisons storing a

Step 2: Group Activity

Instructions:

1. Simulate the tasks physically or conceptually. Examples:
 - Check one locker vs check all lockers.
 - Call students one by one.
 - Guess a number by halving options.
 - Pair students/cards with everyone else.
 2. Record **observed time taken** and **resources used** (e.g., number of cards, notes).
 3. Compare observations with predictions.
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